



Chapter -5 Enzymes

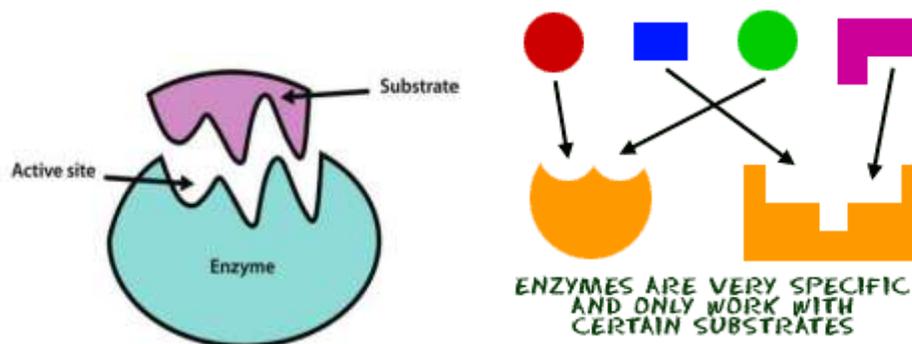
Explain the meaning of each of these terms:

- 1. Enzyme:** Enzymes are proteins that speed up a chemical reaction and is not changed by the reaction. Almost every metabolic reaction is controlled by catalyst called enzyme.
- 2. Denatured:** Destroy the characteristic properties of (a protein or other biological macromolecule) by heat, acidity, or other effect which disrupts its molecular conformation.
- 3. Substrate:** A substrate is a substance which an enzyme (substance produced by living cells) acts on to produce a chemical reaction.
- 4. Product:** Substrates are the starting material of the reaction whereas products can be obtained at the end of the reaction. The difference between substrate and product is that the substrate is the starting material of a chemical reaction whereas product is the compound obtained after the completion of the reaction.
- 5. Active site:** The active site refers to the specific region of an enzyme where a substrate binds and catalysis takes place or where chemical reaction occurs. It is a structural element of protein that determines whether the protein is functional when undergoing a reaction from an enzyme.

Q1. Write the properties of enzymes.

Ans. **Following are properties of enzymes.**

1. All enzymes are proteins
2. They all require water before they are able to function
3. They are only produce by the living cells
4. They are specific in their reaction, one enzyme speeding up one reaction only
5. Enzymes are not altered or used up by their reactions they catalyze, so they can be used again and again
6. The enzyme molecule is only changed during its action an again regains the original shape so large quantity of enzyme is not necessary
7. Enzyme works best at particular temperature. Generally the activity increase up to 35°C then reduce
8. Enzymes are denatured at high temperature because enzymes are protein which are damaged by high temperature
9. Enzymes are working best at particular pH
10. They are specific and each kind of enzyme will catalyze only one chemical reaction



Q2. Explain why enzymes are important for all living organisms?

1. During digestion, large molecules are broken down to smaller ones and these reactions speed up by enzymes.
2. Different enzymes work to break down different kinds of food such as starch is digested to sugar by amylase enzyme, protein is digested to amino acids by protease and fats are digested to fatty acids and glycerol by lipase enzymes.
3. Enzyme catalyst works inside the cells of all living organisms to break down H_2O_2 (Hydrogen per oxide) to water and oxygen because hydrogen per oxide is poisonous and must be broken down immediately.
4. During germination amylase breaks down the stored food inside the seed and provide energy to the embryo for growth.
5. Many enzymes help to make large molecules from small ones such as starch phosphorylase enzyme builds starch molecule from glucose molecule inside plant cells.
6. Almost all metabolic reactions are controlled by enzymes. Without enzymes the reaction would take place slowly or not at all. Enzymes ensure that the rate of metabolic reactions are great enough to sustain life.

Q3. Describe the lock and key mechanism.

Ans. The active site is a particular shape (the lock) into which only one substrate (the key) will fit. The enzyme and the substrate combine and form enzyme substrate complex because the substrate molecule has a complimentary shape to the enzyme and can fit like a key. The enzyme changes the substrate into new molecules called products.

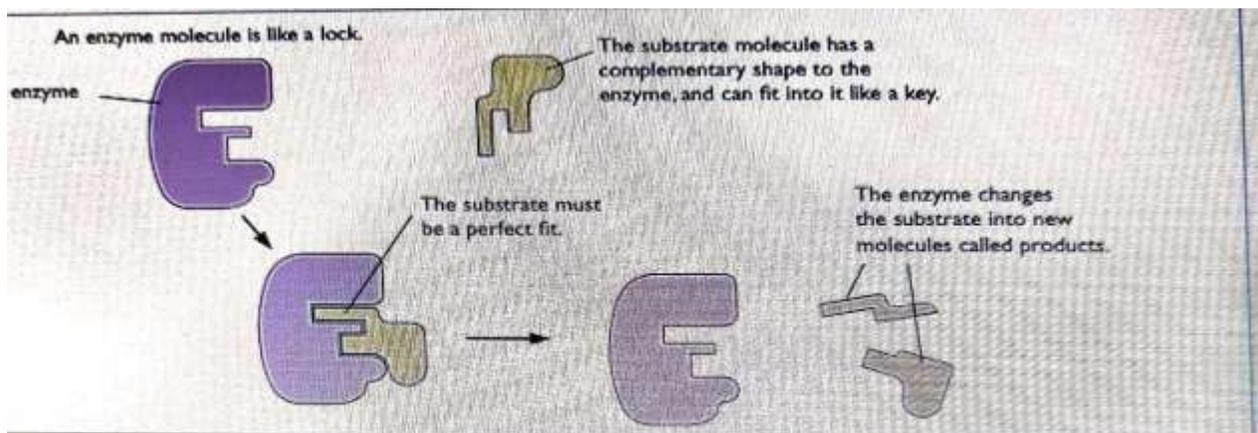
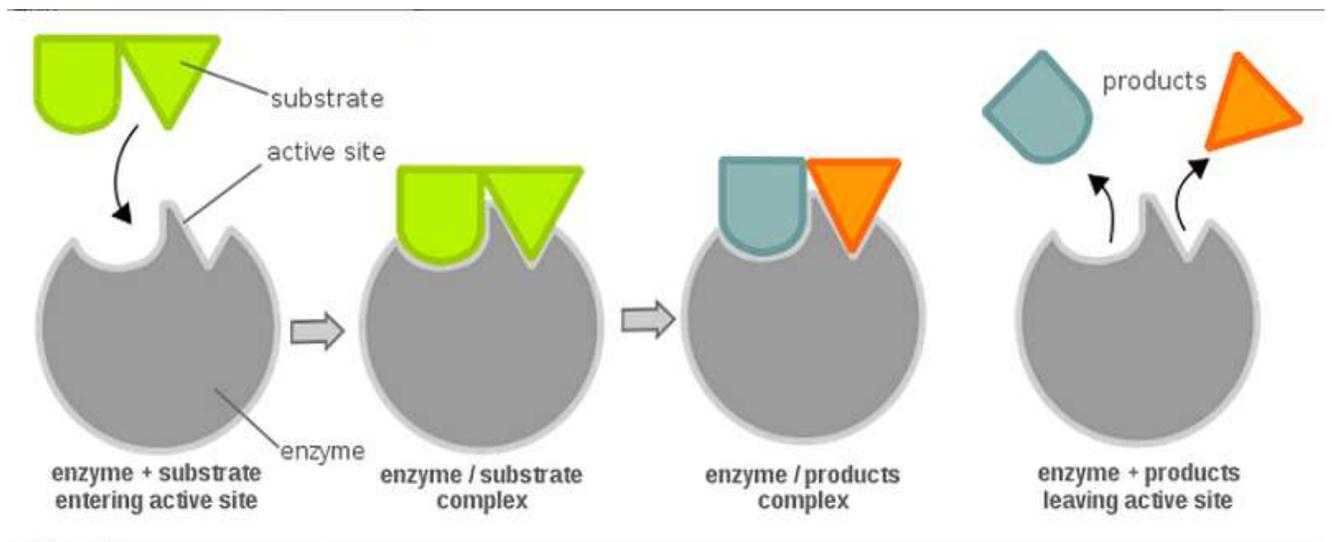
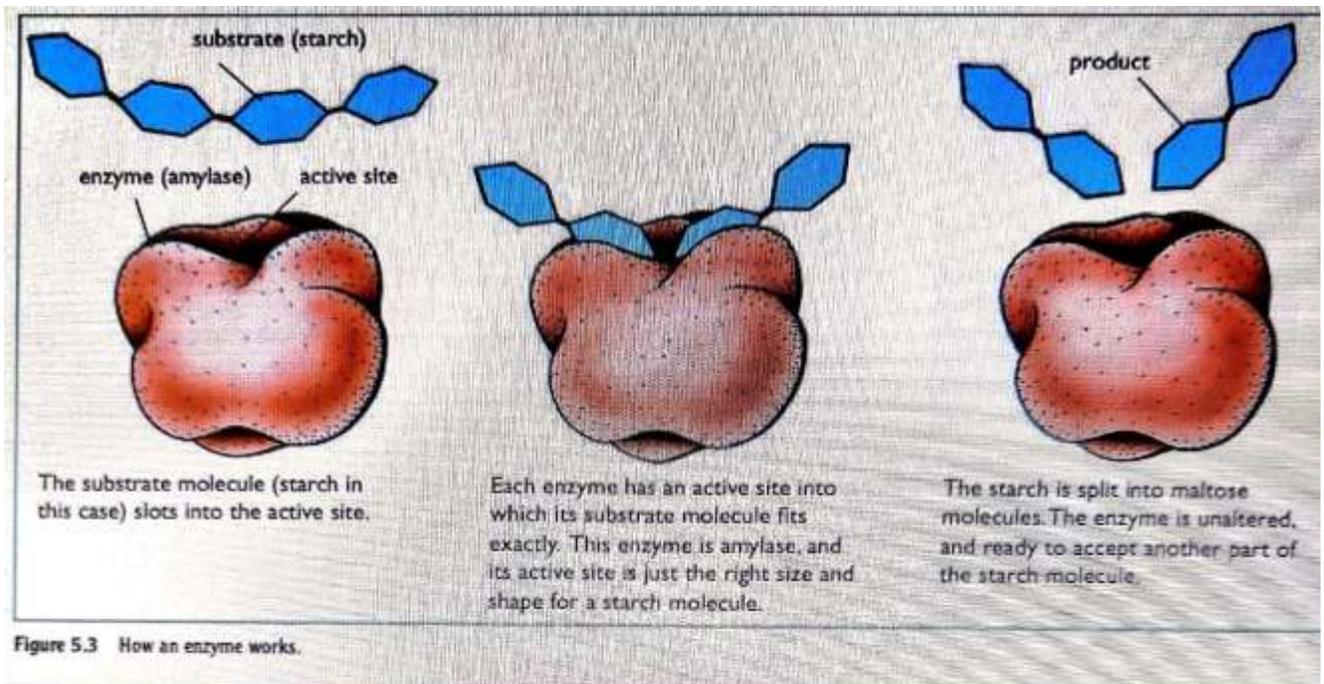


Figure 5.2 The lock and key mechanism.

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Q4. Explain enzyme action with reference to the active site, enzyme substrate, complex substrate and product.

Ans. Enzymes are large molecules, each has its own special shape called active site. Substrate molecules bind in active site and form enzyme substrate complex. The reaction then takes place and enzyme product complex being formed. This splits, releasing the product and enzyme, which is available to form another complex with another substrate molecule.



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Q5. Describe the effect of changes in temperature on enzyme activity.

Ans. Most chemical reactions happens faster at high temperature because molecules have more kinetic energy. At high temperature enzyme is likely to bump into its substrate more often than at lower temperature. They will also heat each other with more energy. so, the reaction takes place more quickly. At high temperature enzyme molecules start to lose their shape. The active site no longer fits with substrate and enzymes is said to be denatured. Most enzymes are denatured above 50°C.

Q6. Describe the effect of changes in pH on enzyme activity.

Ans. The pH of a solution is how acidic or alkaline it is. Most have an optimum pH, at which the work best. Most enzymes in a mammal's body work best at neutral Ph 7 or slightly above. But there are some exceptions like:

- Pepsin, pH 2.0 ----- in the stomach with hydrochloric acid
- Salivary amylase pH 6.8 ----- in the mouth
- Catalase, pH 7.6 ----- in plants e.g potato
- Pancreatic lipase pH 9.0----- in the duodenum

The wrong pH slows down enzyme activity, but this can usually be reserved if the optimum temperature is restored. An extreme pH can denature enzymes and the active site is deformed permanently.